

Creativity, Arts and Science in Primary Education



Training Material

Learning Science Through Slowmation

F. Seroglou, V. Koulountzos



Editors

Fanny Seroglou, Vassilis Koulountzos
Aristotle University of Thessaloniki



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Content

<u>THE CASE PROJECT AND INQUIRY BASED SCIENCE EDUCATION</u>	<u>4</u>
<u>“LEARNING SCIENCE THROUGH SLOWMATION” (LSTS)</u>	<u>7</u>
SOME WORDS ABOUT THE ACTIVITY	7
IMPLEMENTATION PHASES	7
PHASE 1. QUESTION	8
PHASE 2. EVIDENCE	9
PHASE 3. ANALYSIS	10
PHASE 4. EXPLAIN	11
PHASE 5. CONNECT	12
PHASE 6. COMMUNICATION	14
PHASE 7. REFLECT	16

The CASE Project and Inquiry based science education

In CASE, primary teachers are agents of change.

CASE aims to empower teachers' profession with skills and competencies which will enable them to widen their teaching capabilities by strengthening creativity in the classroom. Our approach to creativity lies at the intersection of science and art in education.

Inquiry Based Science Education (IBSE) is a method of teaching and learning that focuses on use of questions, problems, and educational scenarios used to engage students in concepts of science and support their acquisition of scientific knowledge and skills. This is achieved through their **active participation** in activities that make sense to the students, chiefly due to the fact that they are largely initiated by those students. Students understand in-depth the scientific concepts through their own perception of the world that surrounds them and through their own experiences and reflective processes.

In CASE, science and the arts are intertwined. The interaction between these fields within IBSE requires creative solutions on the part of both students and teachers, and enables new ways of thinking about the science curriculum, as shown below.

Various approaches have been developed for IBSE implementation. In CASE, a core cycle of query, evidence collection, analysis, explanation, connection, communication and reflection (see Figure 1) is adopted, based on previous initiatives in the field (e.g. the CREATIONS project¹).

¹ www.creations-project.eu / H2020-EU Project reference: 665917



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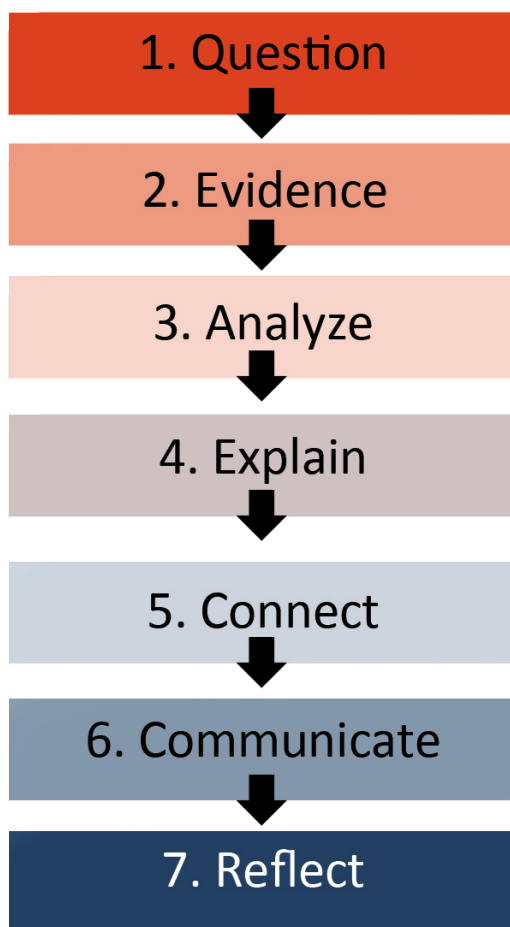


Figure 1: Phases of IBSE

This cycle emphasizes the need for students to engage in creative processes, through which they will act as young scientists and communicate science.

In Figure 2, actions that students perform in each IBSE phase are briefly shown.

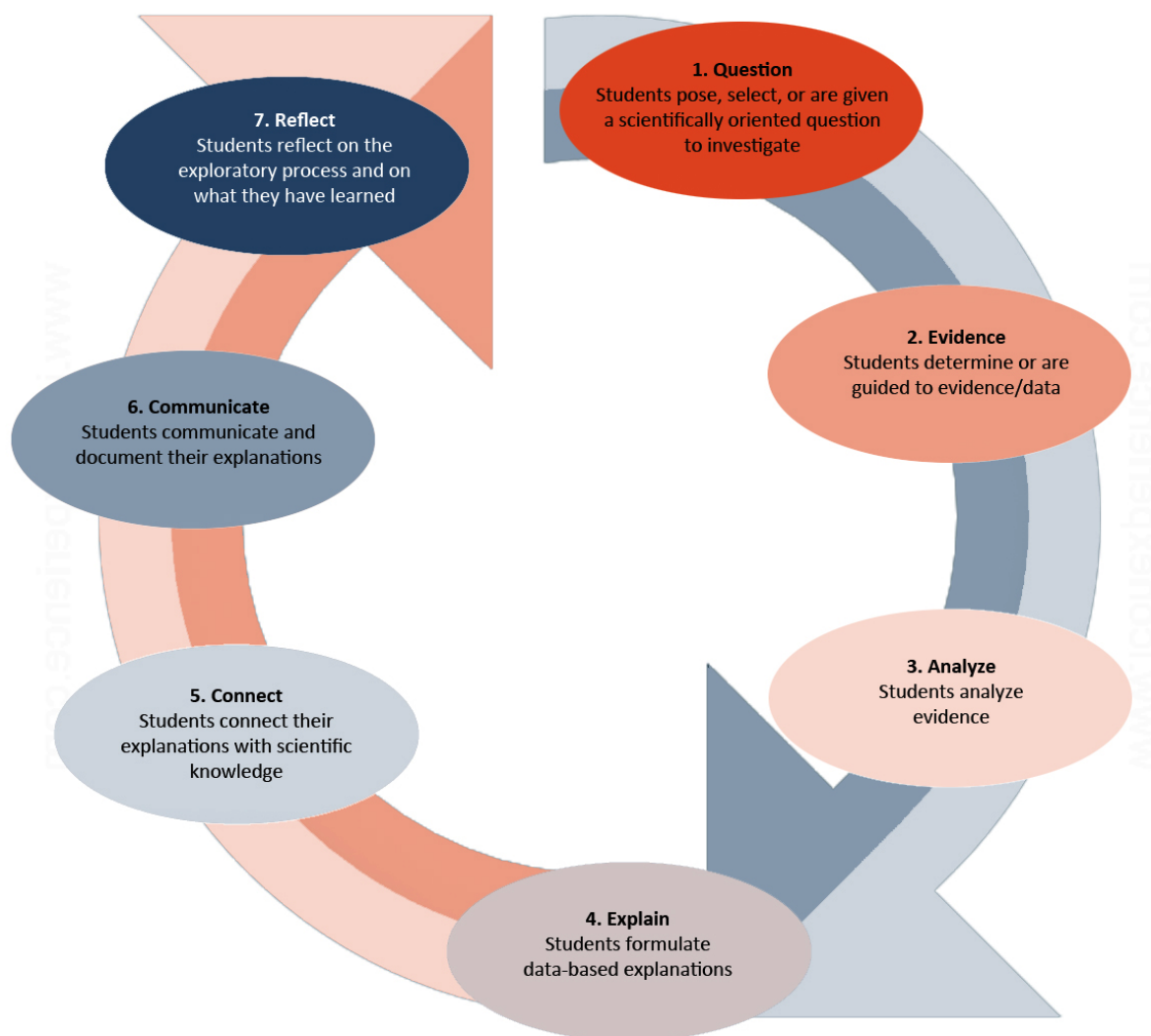


Figure 2: Student actions at each stage of IBSE

“Learning Science Through Slowmation” (LSTS)

Some words about the activity

In LSTS science understanding is based on the use of models, representations and other forms of visualization, in order to explain, clarify and demonstrate complex or abstract phenomena.

Teachers create digital narratives using the technique of slowmation (2 photographs per second) and “animate” science concepts and phenomena through inspired heroes and their adventures in scripts that they develop re-contextualizing science teaching and learning. Teachers through the slowmation process introduce to new ways of teaching science to pupils, representing still images, text, sounds, transforming them and connect them through this incorporation process.

Students use technology to represent their constructions of science concepts and design and construct narrated slowmation to present their science knowledge. Slowmation integrates features from digital storytelling, claymation, object and stop-motion animation. Slowmation engages students with science concepts in multiple and transformative ways creating links as a semiotic progression.

Students can make a narrated slowmation to explain a science concept and through the whole process they create a multimodal representation. They need only two pictures or frames per second (a slow animation called slowmation). Students can create 2-dimensional or 3-dimensional models in a model studio. The materials that students may use are play dough, cartons colored, pictures, drawings, existing game models, toys, natural and everyday materials, cutouts etc. Students use their own still photo camera or mobile phone camera with HD quality to take pictures. They create sounds and produce recordings with their phone recorder or their laptop recorder in order to enhance the explanation of a science concept by adding dialogues, music or natural sounds. Finally, they use their laptops or macs with moviemaker or i-movie software installed to edit the developed digital narrative.

Implementation phases

In the next pages, follows a description of the implementation phases of the LSTS activity.

PHASE 1. QUESTION



KEY CHARACTERISTICS

Students face a scientifically oriented question and are asked to develop a narrative about it.



EDUCATORS' ACTIONS

The teacher and the students choose a chapter / module from the curriculum that has open questions concerning the understanding of certain science concepts. Questions are triggered by the teacher and the students, gradually the students taking over the initiative and finally leading to the subject that will eventually be explored through **slowmation** and **presented in an original digital narrative**.

At this stage, the teacher can introduce other developed examples of science concepts represented in existing slowmation videos. A short introduction in the making of slowmation is also carried out. Examples can be found on the **atlas movies channel** on YouTube



STUDENTS ACTIONS

At this stage pupils decide upon a basic, scientifically oriented question which they wish to explore through the LSTS activity. This happens in dialogue with the teacher.

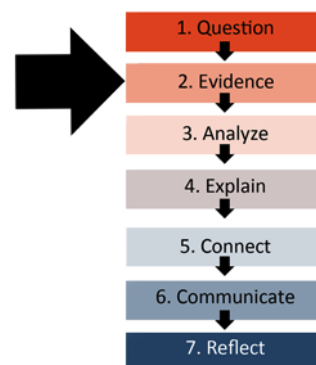


LINKS

YouTube: **atlas movies channel**

(<https://www.youtube.com/channel/UC84Bn5gQR73HKXxX-yIEK9Q>)

PHASE 2. EVIDENCE



KEY CHARACTERISTICS

Students work in groups, search for information and include it in the initial storyboard for narrative that they develop.



EDUCATORS' ACTIONS

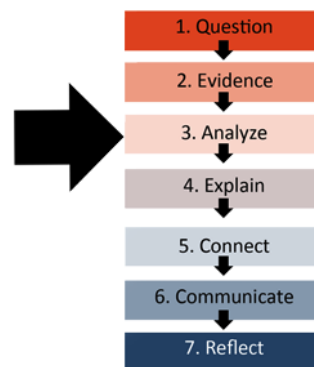
The teacher ensures that all students have access to information on the exploratory question, whether via the internet or through printed material books. The teacher helps students search and collect the necessary information. This information is used in order to make a storyboard, that is, a comic version of the slowmotion to be developed. The teacher guides students to fold a piece of paper in half, then half again. When students open it, they have a four frame comic. They add more paper as needed and make sure they number each frame in order of sequence. The drawing of a storyboard does not have to be artistic in any sense of the word, but each frame must be able to convey what is moving or what has changed



STUDENTS' ACTIONS

Students work in groups and search the web for information on the chosen question / topic. Students use their fantasy and creative thinking to embody this information in the initial storyboard for the digital narrative they are going to develop with the slowmotion technique.

PHASE 3. ANALYSIS



KEY CHARACTERISTICS

This phase includes the organization and analysis of data collected during the previous phase, as well as student dialogue aimed at categorizing that data. Students discuss and analyze science concepts while creating a scenario for slowmation.



EDUCATORS' ACTIONS

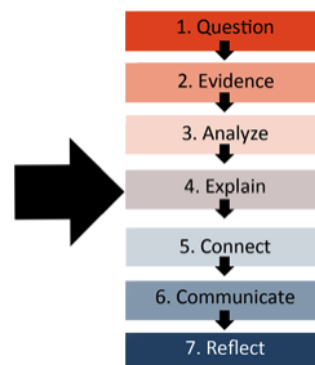
The teacher functions more as a facilitator, splitting the responsibility up between each group member so each student in the group has a task to do. Students work in groups and each group develops a version of the scenario for slowmation including the data collected. The teacher encourages students to express their ideas and facilitates the merging of the group scenarios into one main scenario for the slowmation to be developed.



STUDENTS' ACTIONS

At this stage, students analyze and categorize the data they have collected. Students are going to like this part the most! Students get to re-create what is in each frame of their storyboard on paper or cardboard. They create versions of scenarios in groups and afterwards through discussion merge the various versions into one.

PHASE 4. EXPLAIN



KEY CHARACTERISTICS

Students explain science concepts while creating props (heroes and backgrounds). During this process, they work on explanations of science phenomena related to the science concepts presented in the slowmotion they develop.



EDUCATORS' ACTIONS

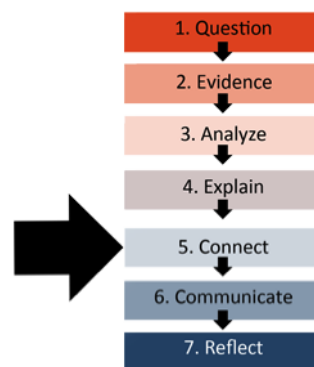
The teacher functions more as a facilitator, helping students to work in groups in order to prepare the props, the background and the heroes of their slowmotion. At the same time coordinates students' discussions as all their unanswered questions are brought forward as they attempt this first visualization of the abstract science concepts.



STUDENTS' ACTIONS

Students love this part of their work! They get to re-create what is in each frame of their storyboard using paper, cardboard, paints, play dough, clay or other 3D constructions. They may use 3D props such as dolls, action figures, toys (cars, trucks, human or animal figures), plants, seeds, soil, natural material etc. They put and adjust their props in mini studios created by empty paper boxes. The possibilities are endless! Before the students start making or collecting props, they should go through their storyboard and make a list of everything they need. Meanwhile, students discuss on basic explanations and procedures related to the science concepts presented in their slowmotion and answer scientific questions that are provoked by the development of the scenery and the heroes of their narrative.

PHASE 5. CONNECT



KEY CHARACTERISTICS

Students explore the subject spherically and find interconnections during teamwork on shooting and recording sounds and narration for slowmation.



EDUCATORS' ACTIONS

Then teacher explains that in order to create the slowmation video, students need to take 2 photos for every second of their digital narrative. The teacher asks them to work out how many photos are needed for a slowmation video that has 1 minute duration. It works out to be 120! The teacher gives tips on how to keep the camera or the smartphone steady in order to enhance the video quality. Here again the teacher plays the role of facilitator and coordinator guiding students to set up the camera on tripod and have all the props ready. The teacher guides the students as they take photos (how to set up the first scene in the viewfinder of the camera, how to use the tripod in the shoot, how to be careful of their own shadows, etc.). The teacher also helps students to record voices and sounds. Many sounds may imaginatively recreated by students under the teacher's instructions.



STUDENTS' ACTIONS

Students do the shooting having in mind the final video quality. Students are encouraged to do their best on framing and focusing during the shooting and at the same time express their artistic expectations. Once the first scene is ready, the first photos are taken. It is crucial that students do not move the camera or the smartphone, the background and props that are not moving in the next shot. If a student bumps the background half a millimeter, then it can have a detrimental effect on the final product. A good way to avoid this is to glue or tape down anything that is not supposed to move. The heroes that move in the scene, are photographed in a series of photos each one presenting a tiny movement. Once the first scene is shot, students move or add the props according to the storyboard of the next scene. Students repeat the process until the end of the

movie. Students can then quickly look through their photos in the viewfinder of the camera to see how the final product will turn out. Just by flicking through the photos, they can see if there are any mistakes that need to be corrected by taking some more photos. At the same time, students record voices and sounds trying to have the best possible sound quality. During this phase, the abstract science concepts acquire form and shape, sound and meaning by the students.

TIPS WHEN SHOOTING

- *Make sure to set cameras resolution to 1280 X 720 or higher.
- *Keep the camera as still as possible when shooting.
- *Do not touch or move props that are not moving in the next scene. The less movement of the camera and props gives us the better result.
- *Be conscious of shadows. Students usually get very excited when shooting as they can start to see their creation come to life. As a result they tend to crowd around the camera and props. If students are near a window or under a light, this can cause big shadows on the students work.
- *It is best for students to do all the shooting on the same day to have the same amount of light for each frame of their movie. If the animation shot over two or more days, then different weather can cause light conditions to change and effect how each day's photos turn out. They can also use their camera light or an external light to correct the shadows.
- *If possible, use a remote camera trigger to minimize camera shake and movement. If using an iPod or iPad, there are many apps; RemotoLite is a free app that does the trick.
- *Another option to reduce camera shake is to use the self-timer on the camera, set to a short delay.
- *Students might realize when shooting that they do not know specific details about the topic. This is a good thing! Let them go off and search for the correct answer, then come back and apply the new knowledge to their video.
- *An alternative for tripod is the use of wooden building blocks or a pile of books to rest the device on.

TIPS WHEN RECORDING

- *When the students are talking, they should speak with a loud, clear voice.
- *Speak loud enough to push the level meter as far to the right without touching the last bar. This will ensure the student's voices are loud enough in the final product.
- *Students can make their voice clearer and cancel out the background noise a little more by using audacity software.
- *Isolate the students groups as possible from the rest of the class, in a quiet place to reduce the background noise in the video. Ask the class to be extra quiet while the students are recording their narration.
- *If the background noise is an issue, you could also add a song to the background to try to cancel out some of the background noise.
- *If using a laptop to record narratives, ask the students after they select record not to touch the computer, or the smart phone until recording is finished, unless they make a mistake. A usual problem when recording audio on a laptop is the noise of the student touching the computer or moving the angle of the screen records along with their voices.
- *Have students write a script so they know what they want to say before they sit in front of the smart phone or the computer. They can watch the video a few times to work out how much they can say in the time they have. Having their script written down helps a lot because they usually have to redo the recording a few times until it is correct.

PHASE 6. COMMUNICATION



KEY CHARACTERISTICS

Students use images and sounds to animate and communicate science concepts as they edit their slowmotion videos. A key feature of this phase is to arrange photos and sounds on the computer, using software like i-movie or Windows Movie Maker.



EDUCATORS' ACTIONS

The teacher acts as facilitator and coordinator guiding students to use a movie maker software. The teacher helps students upload photos and sounds on the computer, facilitating further the students direct and develop their slowmotion. Teacher guide the students to use the audacity software on their computer and smart voice recorder app on their smart phones, facilitating further the students to go on with sound editing.



STUDENTS' ACTIONS

Students communicate science concepts as they edit their slowmotion videos using images and sounds to animate. They discuss on their ideas presented in their slowmarion and on the image of science that will be reflected by their slowmarion when it is going to be released on the web (YouTube channel, CASE website). In this phase, students go through the following steps:

STEP 1 - Students collate each photo for their animation on the computer and they start creating their movie. If they use an IOS device, they can connect it to the computer using the cable to send the pictures.

STEP 2 – They open I-movie or Windows Movie Maker. They select the tab 'home'.

STEP 3 – Students select and drag all photos at once, go and drop them to the storyboard pane of the moviemaker home window. This creates a slideshow with each picture on a separate slide.

STEP 4 –Students need to set the rhythm of the photos at 2 photos per second. In order to do that they change the duration of each photo to 0.5 seconds.

STEP 5 – Students add text in their slowmotion in three ways: a) If they select 'Title', they may add text into a new blank background frame imported as an opening title. b) If the select 'Caption', they add text over a video or a photo imported on the storyboard pane. c) If they select 'Credits' they add at the end of the movie automatically the credits that are necessary.

Whenever a clip with text is selected, a new menu emerges over the top: 'text tools' giving options to animate text and change fonts, sizes.

STEP 6 – Students elaborate recorded sounds, music and narration on the audacity software.

STEP 7 – Students add the final elaborated sound recordings to the Movie Maker software in their slowmotion and combine image and sound editing.

STEP 8 – Students save their sloamation project in the form of a movie in MP4 file.

PHASE 7. REFLECT



KEY CHARACTERISTICS

The main feature of this phase is student reflection and assessment of the LSTS learning approach. Students show the developed video, discuss and reflect with artists and scientists



EDUCATORS' ACTIONS

The slowmation movie produced by the students is presented to a big audience (students, teachers, parents, invited artists and scientists). A discussion follows with students and guests reflecting on the produced slowmation and the way science is communicated. Later on in the classroom the teacher discusses with students about their reflections on how this learning approach has helped students understand the meaning of science concepts and make proposals on how the school curriculum could be informed by their experience.



STUDENTS' ACTIONS

Students present and share their slowmation movie, discussing about their attempt to visualize abstract science concepts. They make comments to each other and receive feedback by their guests at the open screening (students, teachers, parents, invited artists and scientists). Students receive awards for their work, discuss further with artists and scientists on their realization of science phenomena. Later, in a meeting in the classroom with their teacher reflect on how this learning approach has helped their science understand.